



# MEETING ABSTRACT

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# Comparison of ankle joint kinematics of a single athlete during an ankle inversion sprain incident and normal non-injury motions

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## Introduction

The purpose of this study was to compare the ankle joint kinematics including the angles, and their respective angular velocities of a tennis player during an ankle sprain incident and normal non-injury motion. And to deduce whether the sideward cutting motion of the athlete is an intrinsic factor to an ankle sprain.

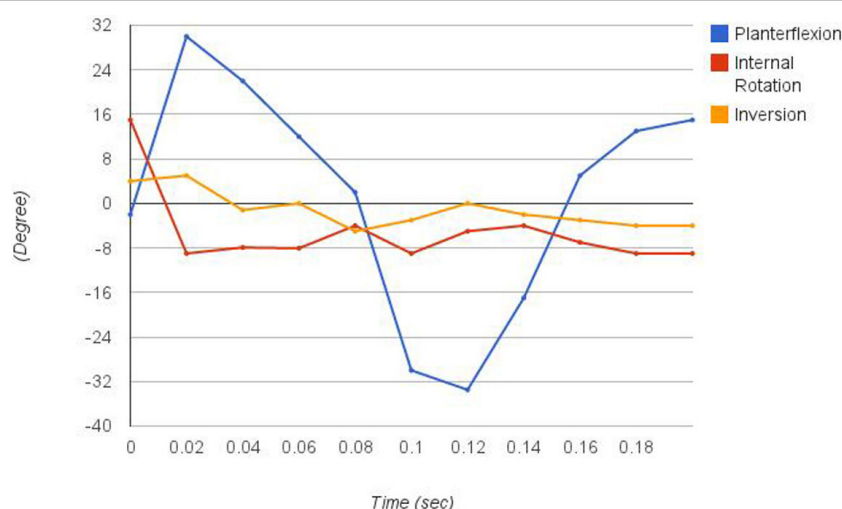
## Methods

Model-Based Image Matching (MBIM) motion analysis technique allows us to understand the leg movement

quantitatively by analyzing the three-dimensional human motion. With validation, it has been used to obtain ankle kinematics during ankle sprain incidents in various sports [1]. In this study, a sideward cutting motion performed by a female athlete was compared against her injured incident reported in 2012 [2].

## Results

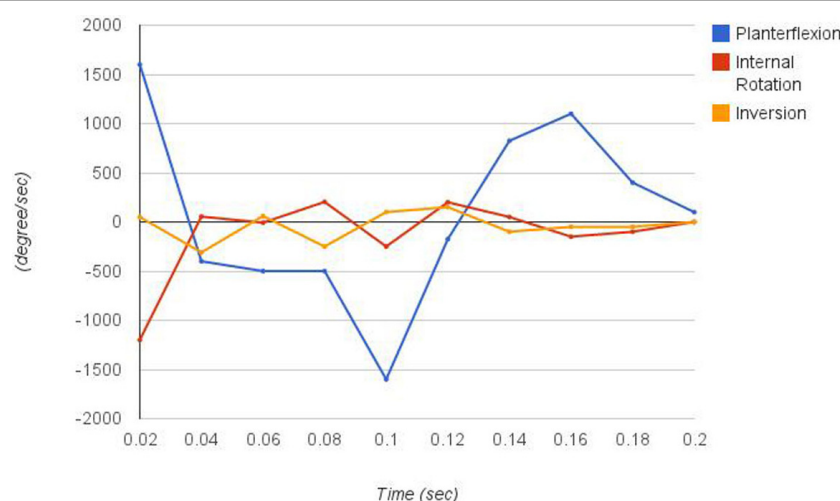
Figure 1 and figure 2 show the right ankle kinematics profile of inversion, internal rotation, and plantarflexion during a sideward cutting motion to the right. Previously,



**Figure 1** Profile of joint orientation. Joint orientation

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**Figure 2** Profile of angular velocities. Joint velocity

the same athlete got injured performing a similar motion, regarding that incident, her peak inversion angle was reported to be  $67^\circ$ , which happened 0.17 second after foot strike [2]. The peak inversion angle of this case is  $5^\circ$ , significantly smaller compared to the injured case. The range of inversion angle was  $5^\circ$  eversion to  $5^\circ$  inversion. The degree of fluctuation of the angle of plantarflexion is greatest among the 3 planes of motion. It ranges from  $-33.5^\circ$  to  $30^\circ$ . The peak velocity is  $1600^\circ/\text{sec}$  for both ways, doriflexion and plantarflexion.

## Conclusion

This study further demonstrates that the sideward cutting motion does not require internal rotation and inversion, instead, ankle goes from plantarflexed to doriflexed, and then back to plantarflexed in a short time. An inverted ankle orientation on landing could be the inciting event of an ankle sprain when performing similar motion. However, a rapid joint motion in the plantarflexion/doriflexion plane is not likely to cause an ankle sprain. Therefore, the risk of performing the sideward cutting depends mostly on the ankle orientation during landing.

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